

Nikhil R. Chari

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Research interests.

terrestrial biogeochemistry | ecosystem ecology | global change biology | soil carbon dynamics

Education.

Harvard University

PhD in Biology

2020 - present

Advisor: Dr. Benton Taylor

University of California, Berkeley

BS in Chemical Biology with High Honors

2016 - 2020

Minor in Earth and Planetary Science

Publications.

In review

8. Muratore, T.J., Chari, N.R., Phillips, R.P., Taylor, B.N., Knorr, M.A., Frey, S.D., 2025. Increased root-derived carbon offsets soil carbon loss under simultaneous warming and nitrogen addition.
7. McCulloch, L.A., Berlingeri, C., Chari, N., Church, L., Prada, C.M., Schuster, W., Terlizzi, K.P., Taylor, B.N., 2025. Ectomycorrhizal fungi disappearance with oak loss increases soil fungal diversity and alters community structure.

Published

6. Brunn, M., Mueller, C.W., Chari, N.R., Meier, I.C., Obersteiner, S., Phillips, R.P., Taylor, B., Tumber-Dávila, S.J., Ullah, S., Klein, T., 2025. Tree carbon allocation to root exudates: implications for carbon budgets, soil sequestration and drought response. **Tree Physiology** 45, tpaf026. <https://doi.org/10.1093/treephys/tpaf026>
5. Chari, N.R., Muratore, T.J., Frey, S.D., Winters, C.L.⁺, Martinez, G.⁺, Taylor, B.N., 2024. Long-term soil warming drives different belowground responses in arbuscular mycorrhizal and ectomycorrhizal trees. **Global Change Biology** 30, e17550. <https://doi.org/10.1111/gcb.17550>
4. Chari, N.R., Tumber-Dávila, S.J., Phillips, R.P., Bauerle, T.L., Brunn, M., Hafner, B.D., Klein, T., Obersteiner, S., Reay, M.K., Ullah, S., Taylor, B.N., 2024. Estimating the global root exudate carbon flux. **Biogeochemistry** 167, 895–908. <https://doi.org/10.1007/s10533-024-01161-z>
3. Chari, N.R., Taylor, B.N., 2022. Soil organic matter formation and loss are mediated by root exudates in a temperate forest. **Nature Geoscience** 15, 1011–1016. <https://doi.org/10.1038/s41561-022-01079-x>
2. Chari, N.R., Lin, Y., Lin, Y.S., Silver, W.L., 2021. Interactive effects of temperature and redox on soil carbon and iron cycling. **Soil Biology and Biochemistry** 157, 108235. <https://doi.org/10.1016/j.soilbio.2021.108235>
1. Dykes, G.E., Chari, N.R., Seyfferth, A.L., 2020. Si-induced DMA desorption is not the driver for enhanced DMA availability after Si addition to flooded soils. **Science of The Total Environment** 739, 139906. <https://doi.org/10.1016/j.scitotenv.2020.139906>

⁺undergraduate mentee

Research awards.

ESA Soil Ecology Student Travel Award (\$200)	2024
Botanical Society of America Graduate Student Research Award (\$1500)	2024
Harvard Forest LTER Graduate Student Research Award (awarded 3x, \$7500 total)	2020, 2022, 2023

US Carbon Program Leadership Award (\$1013.60)	2021
Harvard Graduate Student Council Conference Grant (\$750)	2021

Fellowships & awards.

First Place, Harvard GSAS Three Minute Thesis Competition (\$1000)	2025
ESA Biogeosciences Elizabeth Sulzman Award for Excellence in a Graduate Student Publication (\$400)	2023
Harvard University Certificate of Distinction in Teaching (awarded twice)	2021, 2022
Harvard University Skaff Family Environmental Graduate Fellowship (\$5000)	2020
Second Place, AGU Virtual Poster Session Undergraduate Showcase	2019
Rose Hills Independent Summer Undergraduate Research Fellowship (\$5000)	2019
University of Delaware CANR Summer Institute Fellowship (\$4000)	2018

Selected presentations.

Oral

- Chari, N.R., Aguilar, A.A., DeAngelis, K.D., Frey, S.D., Taylor, B.N.* Warming mitigates root exudate-induced priming effect via changes to microbial biomass, community structure, and gene abundance. Ecological Society of America Annual Meeting. Baltimore, MD. August, 2025.
- Chari, N.R.* The role of root exudation in the global carbon cycle. Salata Scholars Seminar Series. Cambridge, MA. October, 2024.
- Chari, N.R. and Taylor, B.N.* Root exudation rate and exudate composition are independently regulated by CO₂ levels. Ecological Society of America Annual Meeting. Long Beach, CA. August, 2024.
- Chari, N.R.* Arbuscular mycorrhizal and ectomycorrhizal trees exhibit different root nutrient acquisition strategies in response to long-term soil warming. Harvard Forest LTER Symposium. March, 2024.
- Chari, N.R., Muratore, T.J., Frey, S.D., Taylor, B.N.* Long-term soil warming mediates relationships between root exudation and soil carbon dynamics. Ecological Society of America Annual Meeting. Portland, OR. August, 2023.
- Chari, N.R.* Root exudates as hidden mediators of soil carbon storage. Arnold Arboretum Research Talks. Boston, MA. February, 2023.
- Chari, N.R., Aguilar, A.A.⁺, Taylor, B.N.* Soil heterogeneity outweighs the effects of root exudation on SOM in a temperate forest. American Geophysical Union Fall Meeting. New Orleans, LA. December, 2021.
- Chari, N.R. and Taylor, B.N.* Assessing the impacts of root exudation on soil organic matter dynamics. Harvard Forest LTER Symposium. March, 2021.

Poster

- Chari, N., Palk, I., Määttä, T., Malhotra, A., Salmon, V., Taylor, B.* Responses of root exudate rate, flux, and metabolome to whole ecosystem warming in a forested bog. Rhizosphere 6. Edinburgh, Scotland. June 2025.
- Chari, N.R., Muratore, T.J., Winters, C.L.⁺, Martinez, G.T.⁺, Taylor, B.N., Frey, S.D.* Trade-offs between root exudation and respiration under long-term soil warming. LTER All Scientists Meeting. Monterey, CA. September, 2022.
- Chari, N.R., Lin, Y., Lin, Y. S., Silver, W.L.* Interactive effects of temperature and redox on soil biogeochemical processes. American Geophysical Union Fall Meeting. San Francisco, CA. December, 2019.
- Chari, N.R., Lin, Y., Lin, Y. S., Silver, W.L.* Temperature dependency of anaerobic microbial activities in a temperate vs. tropical soil. American Geophysical Union Virtual Poster Session. October, 2019.

⁺undergraduate mentee

Organized session.

Beyond rate... integrating root exudate heterogeneity into the carbon cycle. Organized Oral Session. Ecological Society of America Annual Meeting. Baltimore, MD. August, 2025.

Invited workshop.

The C we do not see: Building international consensus on methods, knowledge gaps, and future needs of root exudation research in ecology. New Phytologist Workshop. Berlin, Germany. June, 2025.

Teaching.

Harvard University

Graduate Teaching Fellow

2021 - 2023

Courses: **OEB 10** Principles of Biological Diversity; **OEB 55** Ecology: Populations, Communities, and Ecosystems; **EPS 164** Environmental Chemistry; **ESE 6** Intro to Environmental Science and Engineering

Guest lecture.

Forest carbon balance and nutrient cycling. ENVS 31 Forest Ecology and Management. Dartmouth College. October, 2024.

Mentorship.

Harvard Forest Summer Research Program in Ecology

2021 - 2023

- Arturo Aguilar, Cristina Winters, Gabriela Martinez, Isa Gooijer, Anisa Robinson

Harvard College Research Program

2021, 2024

- Arturo Aguilar, Finn Crawford

Harvard Museum of Comparative Zoology GUR

2024

- Ian Palk

Harvard College Program for Research in Science and Engineering

2024

- Isabella Cao

Undergraduate Theses Advised

- Crawford, Finn. Carbon Allocation and the Role of Symbiotic Root Associations in Trees Under Elevated CO₂. Harvard University. 2025.
- Palk, Ian. When Roots Sweat: Changing Plant Root Exudation Patterns Under Global Change and Their Potential Impacts on Soil Carbon Dynamics. Harvard University. 2025.
- Gooijer, Isa. Root Exudation Rate in Response to Long-term Soil Warming and Inorganic Nitrogen Addition in Temperate Forests. Harvard University. 2024.

Press.

“[Getting to root of possible carbon storage changes due to climate change.](#)” Harvard Gazette. 2023.

Reviewer.

Journal peer review (number of manuscripts reviewed)

Biogeochemistry (2); Communications Earth & Environment; Earth’s Future; Environmental Science & Technology; Global Biogeochemical Cycles; Global Change Biology; Journal of Applied Ecology; New Phytologist (3); PeerJ; Plant and Soil (3); Plant, Cell & Environment (2); Soil and Tillage Research; Soil Biology and Biochemistry (2); Tree Physiology

Co-authored conference abstracts.

Brunn, M., Mueller, C., *Chari, N.*, Meier, I., Obersteiner, S., Phillips, R., Taylor, B., Tumber-Dávila, S.J., Ullah, S., Klein, T. Tree carbon allocation to root exudates: Implications for forest carbon budgets and soil sequestration. Rhizosphere 6. Edinburgh, Scotland. June, 2025.

- Phillips, R., Oh, Y.E., Muratore, T., *Chari, N.*, Frey, S., Midgely, M., Taylor, B. Whispers in the soil: What do root exudates reveal about plant-soil interactions in the forest and what are the secrets that we've yet to unearth? *Keynote Address*. Rhizosphere 6. Edinburgh, Scotland. June, 2025
- Prada, C., Zehr, L., Bisson, A., Church, L., Dallstream, C., *Chari, N.*, Taylor, B. Tropical trees shift allocation to rhizosphere microbes under elevated CO₂. Rhizosphere 6. Edinburgh, Scotland. June, 2025.
- Obersteiner, S., *Chari, N.*, Oppenheimer-Shaanan, Y., Taylor, B., Klein, T. Belowground carbon allocation of trees under drought and elevated CO₂. Rhizosphere 6. Edinburgh, Scotland. June, 2025.
- Määttä, T., *Chari, N.*, Childs, J., Iversen, C., Salmon, V., Schwaner, G., Weber, S., Malhotra, A. Peatland shrub roots increase resource acquisition with warming. European Geophysical Union General Assembly. Vienna, Austria. April, 2025.
- Muratore, T., *Chari, N.R.*, Taylor, B., Phillips, R.P., Frey, S.D. Increases in plant carbon inputs offset soil carbon loss under simultaneous warming and nitrogen addition. American Geophysical Union Fall Meeting. Washington, DC. December, 2024.
- Palk, I.⁺, *Chari, N.R.*, Taylor, B. Effects of elevated CO₂ on root exudation rates and composition across multiple ecosystems. American Geophysical Union Fall Meeting. Washington, DC. December, 2024.
- Muratore, T.J., *Chari, N.R.*, Knorr, M.A., Phillips, R.P., Taylor, B.N., Frey, S.D. Belowground plant carbon inputs mitigate elevated soil respiration observed under warming and nitrogen addition. Plant Biology Initiative Symposium. Boston, MA. May, 2024.
- Church, L.A., Taylor, B.N., McCulloch, L.A., *Chari, N.R.*, Berlingeri, C., Prada, C., Heslop, C., Schuster, W., Terlizzi, K.. Oak mortality leads to increased diversity and shifting community composition of soil fungi in a temperate hardwood forest. Ecological Society of America Annual Meeting. Portland, OR. August, 2023.
- Muratore, T., *Chari, N.*, Knorr, M., Simpson, M., Phillips, R., Melillo, J., Taylor, B., Frey, S. Long-term soil warming interacts with mycorrhizal tree type to constrain ecosystem carbon loss in a mixed arbuscular mycorrhizal and ectomycorrhizal forest. Ecological Society of America Annual Meeting. Portland, OR. August, 2023.
- Winters, C.⁺, Martinez, G.⁺, *Chari, N.*, Muratore, T., Frey, S.D., Taylor, B. Forest carbon cycling belowground: changes in root-based carbon flux under warming temperatures. SACNAS National Diversity in STEM Conference. San Juan, PR. October, 2022.
- Berlingeri, C., *Chari, N.*, Church, L., Heslop, C., Liao, W., McCulloch, L., Schuster, W., Terlizzi, K., Taylor, B. How drivers of the forest understory shift between biotic and abiotic controls based on deer browsing and oak mortality. Ecological Society of America Annual Meeting. Montreal, CA. August, 2022.
- Berlingeri, C., Heslop, C., Terlizzi, K., *Chari, N.*, Church, L., DeGroot, K., Liao, W., McCulloch, L., Taylor, B. Biotic and abiotic drivers of recovery in a northeast oak-hickory forest. Plant Biology Initiative Symposium. Boston, MA. May, 2022.
- Mackie, C., Xu, B., Kostko, O., *Chari, N.*, Zhang, E., Head-Gordon, M., Ahmed, M. A molecular view of glycerol-water hydrogen bonding patterns. American Physical Society March Meeting. Denver, CO. March, 2020.
- Dykes, G.E., *Chari, N.R.*, Seyfferth, A.L. Silicon induces arsenite and monomethyl arsenic release from soil solids: the *casus belli* of microbial chemical warfare? Goldschmidt. Barcelona, Spain. August, 2019.
- Dykes, G.E., *Chari, N.*, Seyfferth, A.L. Methylated arsenic dynamics in silicon-amended flooded rice paddies. SSSA International Soils Meeting. San Diego, CA. January, 2019.
- ⁺undergraduate mentee